Swami Ramanand Teerth Marathwada University, Nanded

SUBMISSION OF THE Ph.D. REGISTRATION SYNOPSIS

ON THE TOPIC

"RECOGNIZING SENTIMENTS IN REGIONAL LANGUAGE TEXT ON SOCIAL MEDIA USING MACHINE LEARNING TECHNIQUES"

UNDER THE FACULTY OF

SCIENCE AND TECHNOLOGY

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SUBMITTED BY

Mr. SUDARSHAN M. SIRSAT

UNDER THE GUIDANCE OF

Dr. NITISH S. ZULPE

Research Guide, Department of Computer Science,

COCSIT, Latur-413512

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1. Introduction

Increased use of social media through various demographics all across India created vast opportunities in textual analysis of textual contents using microblogging websites and social media applications. It has been observed that social media users use national language or regional languages to express themselves on various social media websites, they also express their reviews about the products and services they buy,watch or use from e-commerce websites and audio/video contents from OTT platforms. These regional/national language contents provide immense analytical and research opportunities to the research scholars across the globe. This proposed research work will focus on analyzing the effectiveness of marathi language contents on the internet using various tools and approaches used for the sentiment analysis of such regional language contents generated through microblogs and textual analysis of any such contents using various tools and techniques available and its comparative analysis to understand the possible available solutions.

India is the biggest market for next billion internet users with low-price smartphones alongwith affordable data prices. India is a nation of 19,500 languages or dialects, most of the un-digitized population comes from the remote locations of India which uses regional languages for oral,written or digital communication. The telecom service provider and internet service provider companies are using market mix strategies to join this un-digitized chunk of population to the mainstream digital world[1]. According to a study conducted by Google-KPMG, about 70% people find contents in regional languages more reliable than English language contents, and there is a significant increase of 13% annually in the regional language content creators or social media users[2]. These frequently generated social media textual contents in regional language provides many research and data analytics opportunities to the scholars in this domain.

The study will try to cover the recent work done by the scholars in the regional language sentiment analysis domain and will try to figure out the best possible approach to take this study further. Since a lot of work needs to be done in the regional language sentiment analysis domain, deciding the steps in designing the workflow model would also be important because there is no

one single approach to solve the problem currently. There are various social media organizations which are looking for these types of projects and scholars working in this domain since its the demand of today's social media users trends due to their compatibility in regional language to read and share the contents.

2. Significance of the topic / Research problem statement:

Regional languages are given as much importance as world wide spoken languages like English, German, French etc, and the top software as service(SaS) providers like google, and social media networks like facebook, instagram and even twitter. Promoting use of regional languages by their global users. Marathi/Devanagari and Hindi are two such Indian regional languages in which much nobel literature work is generated by many state of the art intellectuals. To find the uniqueness of the contents is the challenge faced by many such authors, poets and by readers too while selecting the right contents to read. This proposed research work will focus on originality of marathi language literature by using existing open source or creating new plagiarism tools if required.

3. Literature review

1. **M. K. Patil(2021) et.al**, focuses on the opportunities and challenges the marathi language provides to the researchers in India being 4th most spoken language in India and 15th most spoken global language. This work is mostly based on review work and context-based sentiment analysis and shaded-based sentiment analysis which is categorical sentiment-corpus based classification problem[1].

2. **A. Madan(2021) et.al**, the research scholar focuses on use of Sentiment Analysis(SA) to get the insights into the opinionated text mined from social media or documents available for the same. Twitter is one of the most microblogging social media websites used majorly for such text mining in recent decades by a number of researchers. The scholars talk about Natural Languages techniques used for basic initial processing of such opinionated text by Lexicon based approach(LBA) and Machine Learning approach(MLA) based on supervised algorithms. Use of HindiSentiWordNet based

enhanced dictionary for with lexicon based approach along with Hybrid based Approach(HBA) which combines LBA and MLA to solve the classification problem of movie review tweets in Hindi language. They did the comparative analysis of the LBA and MLA techniques for the same[7].

3. **V. Yadav(2021) et.al**, the scholars focus on the sentiment analysis of product and service reviews by their consumers and customers to get the sense of how these products and services are up to the customer satisfaction marks. Determinative recommendations from the Aspect based sentiment analysis through categorizing and analyzing the opinionated text from e-commerce portals. This proposed research work focuses on polarity check, sentiment analysis and conflict opinions amongst consumers of the products and services by developing aspect based sentiment analysis models for Hindi language reviews[4].

4. **M. Divate(2021) et.al**, the scholar worked on machine learning based sentiment analysis techniques for Maharashtra state regional and mother tongue language Marathi. When it comes to sharing news online on various social media networks, research scholars focus on helping social media users reading positive news to avoid depression and negativity using sentiment analysis techniques. This study propose use of filters before sharing any news on social media before posting it on social media using three approaches, sentiment analysis on text, audio, emotions, polarity-based sentiment analysis check and LSTM algorithm of deep learning techniques. The study identified polarity with accuracy of 72% level[13].

5. **S. C, S. Adak(2021) et.al**, use of microblog based mined text like text from twitter and various other such websites has increased over recent few years, since the data collected can directly be used for feedback and sentiment analysis by processing it a little bit. This text can be helpful in understanding the features and characteristics of effectiveness of marketing campaigns and its performance over other strategic policies. Subjective detection and sentiment analysis can be such basic two steps, along with machine learning algorithms like Support Vector Machine(SVM), Naive-Bayesian and deep learning etc. through this research work researchers focused on Hindi language based text

for classification. The Recurrent Neural Network(RNN) and Convolution Neural Network(CNN) and combined approach has been used by scholars with a Hindi language based subjective data extracted from a dataset made from movie reviews[8].

6. **R. Naukarkar(2021) et.al**, in this study scholars focused on polarity checking on Marathi text based tweets through sentiment analysis and machine learning concepts. Tweets are being classified as positive, negative and neutral with higher accuracy outcomes[15].

7. **K. Yadav(2020) et.al**, research scholars focused Hindi-English based code language for informal communication on various social media platforms. The challenge is at a different level according to the authors due to sentiment analysis of two language combined approaches by social media users to write the comments, reviews and posts. The code-mix language usage is increasing rapidly due to easy to share opinions for larger groups of social media users and easy to type features which creates the challenges for machine learning based research enthusiasts to clearly identify and analyze the sentiments. Hence conventional sentiment analysis approach will not work here as per researchers, so they used Ensembling based hybrid Bavi Bays approach and SVM, Linear regression techniques for the same. They have also used SGD classifiers and a bidirectional LSTM based approach which gave them desired output in their research study[5].

8. **A. Goel(2020) et.al**, authors did some basic work of polarity check on Hindi language based text from social media like twitter using sentiment analysis and some deep learning methods, the paper focuses on polarity check only by classifying them on positive negative sentiment polarity[6].

9. **A. Prasad(2020) et.al**, worked in the field of information retrieval and text processing which has various application areas like business analytics, politics, social reforms etc. Hindi language is mostly spoken regional language in India which has challenges in the area of sentiment analysis like lack of annotated corpus and lexical resources as

compared to the english language. The scholars have developed a semantically and syntactically annotated corpus in the domain of home remedies written in hindi language weblogs. The corpus can also be useful to other researchers working in the Hindi language opinion mining system in various such domains.[11].

10. **P. Bafna(2020) et.al**, many websites enable regional language contents to make users understand the information in their mother tongue or regional known language. Hindi is one of the majorly spoken languages in India, specially in the government domain. The classification and clustering operations can be carried out using prosed and verses as input data source. Natural Language Processing and machine learning techniques can be applied over such Hindi language based text using BaSa technique to identify context based common tokens from given corpus. Corpus of 820 proses and 710 veses was processed and scholars observed significant output in the area[12].

11. **C. Nanda(2018) et.al**, use of social media for posting comments and reviews on products, services, movies etc is largely in trend, though english is mostly and globally used language for this. In India Hindi is a widely used language to give reviews and share information on social media. This study focuses on sentiment analysis of movie reviews in Hindi language by researchers and also to check the polarity of them with machine learning techniques[3].

12. **S. K Bharti(2017) et.al**, to avoid direct negativity and use of intensified positive words to express sarcasm over social media network based opinionated text is one of the upcoming challenges for the sentiment analysts over the last few years. This is more visible on microblogging websites like twitter than other social media or messaging web pages like facebook, instagram and whatsapp, due to easy sharing limited text capability of twitter. The scholars proposed an automated sarcasm detector system for text based data, specifically for regional languages like Hindi, Marathi, Bengali etc since they are less explored to any such machine learning techniques due to their unique lexicon structure and features. The researchers also proposed context-based pattern finders for

"sarcasm as a contradiction between a tweet and the context of its related news" to detect sarcasm out of Hindi language text/tweets and they have achieved 87% accuracy in the same[9].

13. **S. Pawar(2017) et.al**, the author focuses on the requirement of sentiment analysis in marathi language in current scenarios of internet boom and huge textual information availability, the scholar used Support Vector Machine, Naive Bayes and Maximum Entropy machine learning approach for sentiment analysis and classification problem through lexicon based sentiment analysis. The study had faced many challenges namely polarity, negation handling, aspect based sentiment analysis etc. the scholar mentions unavailability of the resources rather than techniques to accomplish the work[16].

14. **S. Pundlik(2016) et.al**, Use of mother tongue and state wise regional languages on internet and social media is increasingly reported on various platforms, like giving reviews, passing comments etc. this gives researchers an area to do the analysis with machine learning techniques like natural language processing and sentiment analysis. Analysis may vary with types of contents like classification problems in terms of speech, sentiment analysis in terms of product or service reviews and polarity checking in case of some comments on particular topics. Researchers proposed classifications models using HindiSentiWordNet(HSWN), LMClassifier and a combined approach to get better results[2].

15. **Ansari(2016) et.al**, textual data available through the advent of social media gives various research opportunities in sentiment analysis and various other textual analysis. The paper is trying to assess the current status,standards and achievements of researchers and their studies. Also scholars trying to propose the precisional improvement techniques and comparative findings. Like direct and simplest approach of using sentiment analysis without NLP or machine learning language specific methods. The study just mentions the marathi transliterated text and its area of applications in sentiment analysis[14].

16. **V. Jha(2015) et.al**, the textual information shared by social media, commercial websites and government web pages can be used for understanding the sentiments they have expressed in textual form. Such textual information can be broadly categorized into opinion and facts and can also be used to make well studied decisions for business process or public policy making. This text based data can also be categorized or classified as subjective or objective, this also can be applied to Hindi language based unicode standards UTF-8 contents. Hindi language subjectivity analysis(HSAS) is proposed in this study via two methods, first is English language opinion finder subjectivity lexicon and another one is to use a small seed word list of Hindi language and expand it to generate Hindi language subjectivity lexicon. Different techniques were used by scholars to evaluate hindi language lexicons in which they have achieved 71.4% agreement with human annotators and approximately 80% accuracy in classification on parallel language dataset. The simulation techniques used by researchers validated the test conducted for the same[10].

17. **V. Rohini(2017) et.al**, did the domain based sentiment analysis of Kannada language like attitude, opinion detection in the regional language text using machine learning algorithms for polarity check, opinion mining and other basic total sentiment score calculations[23].

18. **R. Naidu(2017) et.al**, worked on the sentiment analysis and polarity check of telugu corpus data and identified the positive, negative and neutral statements and used TeluguSentiWordNet dictionary for the same[24].

Comparative literature review:

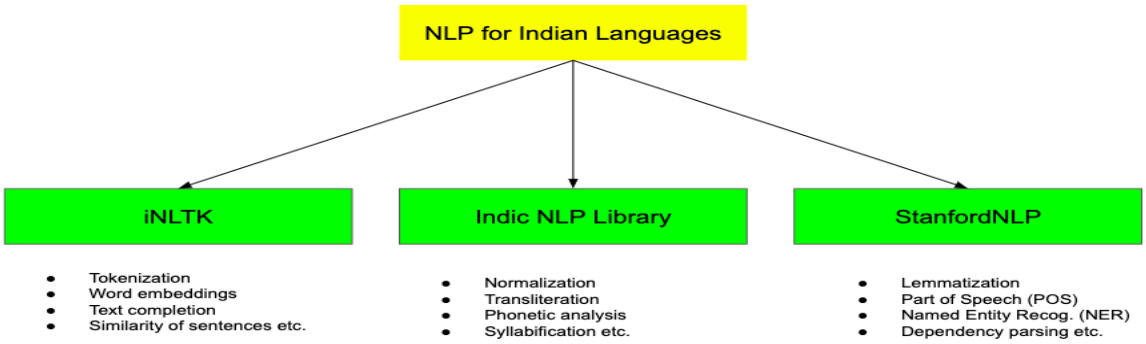
Sr.No	Author ,Year	Techniques used	Findings	Research Gap
1	M. K. Patil (2021)	Context based sentiment analysis, Sharded based sentiment analysis	categorical sentiment-corpus based classification problem	Insufficient resources(language dictionary)
2	A. Madan (2021)	Lexicon Based Approach (LBA), Machine Learning Approach (MLA), and comparison	Used for basic initial processing of twitter based opinionated text	Worked on Hindi, and sentiment analysis part done
3	V. Yadav (2021)	Polarity check, Aspect Based Sentiment Analysis	Determinative Recommendations on product/service reviews	Worked on single line Hindi text
4	M. Divate (2021)	Machine learning based sentiment analysis, Polarity check,LSTM	Created filters to avoid sharing fake news in regional language	Accuracy can be increased upto 90% to 95% for reliable results
5	S. Adal (2021)	Sentiment analysis on **Hindi language** text, SVM, RNN,CNN	The analysis on effectiveness of marketing campaigns	Focus is on comparative analysis
6	R. Naukar dar (2021)	Polarity checking on Marathi, Classification problem	High accuracy outcomes on positive negative and neutral words identification	Only polarity check on words
7	K. Yadav (2020)	**Hindi-English** code mix language, SVM, SLTM, Stochastic Gradient Descent (SGD)	Sentiment analysis of Hindi-English code mix language	Code-mix language adds challenges of two languages
8	A Goel (2020)	**Hindi**-Sentiment analysis, Polarity check	Basic work and concept paper	No outcomes provided
9	A Prasad (2020)	**Hindi** language based Information retrieval & processing	Developed senatatical and semantically annotated corpus for hindi language	Corpus generated is annotated so it depends on inputs from users
10	P.	BaSa technique,	Identification of	Finding exact

	Bafana (2020)	classification and clustering of proses and verses	context based common tokens, Corpus of 820 proses and 710 veses was processed	context/intentions is the chanllange
11	C. Nanda (2018)	Sentiment analysis, Polarity check	Sentiment analysis of Hindi language based movie reviews	
12	S. Bharti (2017)	Sentiment analysis, Opinion mining	Proposed automated sarcasm detector system for text data	Finding sarcasm can be dependent on creativity of content creator
13	S. Pawar (2017)	SVM,Lexicon based sentiment analysis	Technical solutions available	Insufficient resources(language dictionary)
14	S. Pundlik (2016)	NLP,HindiSentiWordNe, LMClassifier	Analysis of types of contents and techniques applicable	
15	Ansari (2016)	Comparative analysis of techniques available	Assessment of current status, standards and achievements	Focus on Comparative analysis than accuracy
16	V. Jha (2015)	Hindi language subjectivity analysis(HSAS)	71.4% agreement with human annotators and approximately 80% accuracy in classification on parallel language dataset	Work done on hindi language subjectivity

The papers studied for this research work are the fundamental work for knowing the current work going on in the field and technical domain. And we have found that most of the work is done in national language Hindi for polarity check and basic sentiment analysis with the help of HindiSentiNet libraries. As per literature review findings there is no state of the art tool or approach towards doing sentiment analysis of Maharashtra state regional language Marathi, so this research work proposes the development of language dictionary as future scope work for better marathi language sentiment analysis. We will also study the sentiment analysis approaches

done for foreign languages by global scholars as the base papers to develop our approach in future for detailed research.

Techniques and tools available for regional language sentiment analysis:



4. Recent Research Gap:

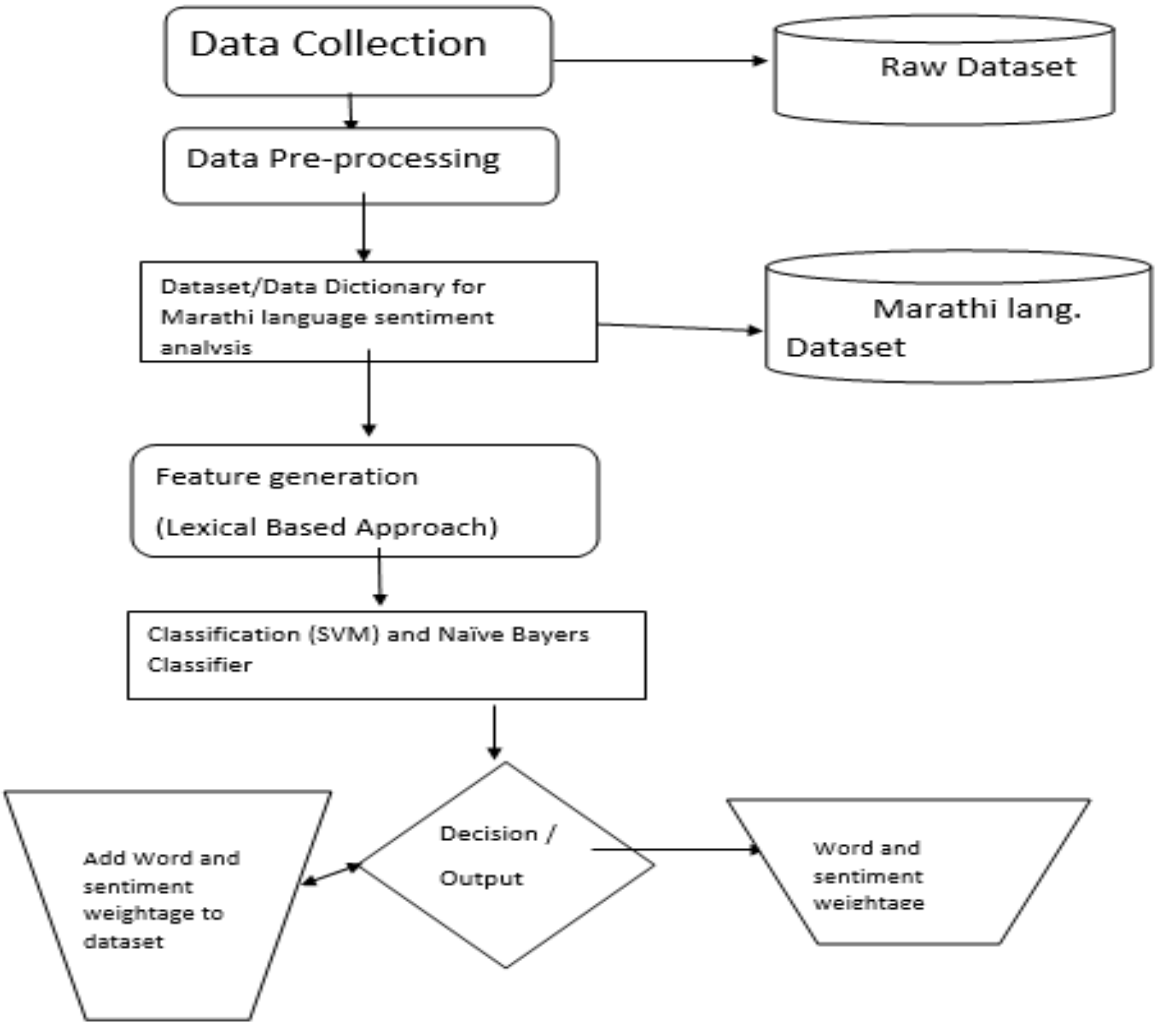
Various scholars across India tried working on the regional language majorly Hindi language text for sentiment analysis in various domains like cooking, movie reviews, tweeter based text and its polarity and e-commerce reviews to check polarity analysis. There is hardly any work done in Marathi language based text mining and analysis irrespective of the increased number of Marathi language based social media users, bloggers and authors. No proper datasets are available for any such textual analysis so we can use this as an opportunity to create a lexical based dataset and dictionary for sentiment analysis which can help many marathi language based researchers in future. There are very few tools available to check the uniqueness of the contents created in Marathi language; this is also one of the gaps we are trying to fill up.

5. Research Objectives:

1. To analyze the effectiveness of Marathi language contents on internet users
2. To develop regional language dataset for sentiment analysis
3. To analyze the impact of regional language content on readers and social media users using Natural Language Processing (NLP) and Sentiment Analysis

6. Proposed research methodology/model:

1. Data collection/preparation
    a. Web Scraping for marathi based articles,blogs, reviews etc
    b. Collecting microblogs, reviews from various social media and e-commerce websites
2. Dataset preparation
    a. Creation of data dictionary
    b. Data corpus creation for sentiment analysis
    c. Analysis the effectiveness of marathi data corpus
3. Analysis and identification of python/R language based sentiment analysis package for Marathi language text and its accuracy
4. Comparative study of machine learning algorithms on Marathi language text for sentiment analysis and natural language processing to find and predict the originality of text



7. Importance of study/ Society application:

a. International status

Chinese scholar J Wang(2016) did the dimensional sentiment analysis on Chinese language text using CNN_LSTM machine learning algorithms[21]. How Indonesian conjunctions play an important role in building the meaning of the statements inside complaints data were studied by the A. Anggraini[22]. Scholars also tried to perform Aspect Based Sentiment Anaq(ABSA) on low resourceful languages like Russian, Dutch, Spanish, Turkish, and French languages recently in the year 2021[25].

b. National Status

Majority of the work is done in national language sentiment analysis i.e Hindi language contents and most of the work is based on polarity check and basic sentiment analysis using HindiSentiWordNet dictionary. HindiSentiWordNet is the only dictionary available for this purpose, and scholars have done movie review analysis, product reviews analysis and analysis of reviews available on cooking videos. sentiment analysis on various other state languages like kannada, telugu, urdu etc.

7. Proposed work Plan/ Formulation and Structure of Study:

a. Year-wise Plan of work and targets to be achieved

Web scraping will be mainly used for creation of customized regional language i.e Marathi language dataset for further text analysis. This dataset will be further labeled with its sentiment categorization i.e positive, negative and neutral. It will be further classified into happy, sad, angry etc more emotions for sentiment analysis.

We may use some existing data dictionaries for the initial natural language processing and sentiment analysis of data, and then develop our own specific dataset for higher precision of text analysis and predictions. Help of linguistic experts may be needed for the same and will be acknowledged from time to time throughout our publications. All these can be published in any or all of the following forms:

- Research papers in journal and conference (2 to 3 years)
- Survey and data analysis (9 months)
- Training of new fake news labeled data sets.(9 months)
- Input in cyber policy framing/making for false/fake news (1 year)
- Book chapters/Articles (1 to 2 years)

The outcome will help find the effectiveness of Marathi language contents on social media pages, micro blog websites and any other web pages published on the internet. Also the impact of these Marathi languages contents on the regional internet users can be analyzed in the future.

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Signature
Research Scholar
Sudarshan Sirsat

Signature
Research Supervisor / Guide / Co-guide
Dr. Nitish Zulpe